

# TEST # 4 REVIEW

## WORK, KINETIC AND POTENTIAL ENERGY

### Practice problems

**For all practice problems assume that the acceleration due to gravity is 10 m/s<sup>2</sup>**

1. Determine the amount of potential energy of a 5.0-N book that is moved to three different shelves on a bookcase. The height of each shelf is 1.0 m, 1.5 m, and 2.0 m.

Shelf 1 = 1.0 m

given variables	equation	work / picture	answer
m= h= g= PE =	PE = m*h*g		

Shelf 2 = 1.5 m

given variables	equation	work / picture	answer
m= h= g= PE =	PE = m*h*g		

Shelf 3 = 2.0 m

given variables	equation	work / picture	answer
m= h= g= PE =	PE = m*h*g		

2. You are on in-line skates at the top of a small hill. Your potential energy is equal to 1,000. J. The last time you checked, your mass was 60.0 kg.

a. What is the height of the hill?

given variables	equation	work / picture	answer
m= h= g= PE =	PE = m*h*g		

b. If you start rolling down this hill, your potential energy will be converted to kinetic energy. **At the bottom of the hill, your kinetic energy will be equal to your potential energy at the top.** Calculate your velocity at the bottom of the hill.

given variables	equation	work / picture	answer
m= v= KE =	KE = $\frac{1}{2} * m * v^2$		

3. A 1.0-kg ball is thrown into the air with an initial velocity of 30. m/s.

a. How much kinetic energy does the ball have?

given variables	equation	work / picture	answer
m= v= KE =	$KE = \frac{1}{2} * m * v^2$		

**b. How much potential energy does the ball have when it reaches the top of its ascent? How do you know this?**

How high into the air did the ball travel?

given variables	equation	work / picture	answer
m= h= g= PE =	$PE = m * h * g$		

4. What is the kinetic energy of a 2,000.-kg boat moving at 5.0 m/s?

given variables	equation	work / picture	answer
m= v= KE =	$KE = \frac{1}{2} * m * v^2$		

5. What is the velocity of an 500-kg elevator that has 4000 J of energy?

given variables	equation	work / picture	answer
m= v= KE =	$KE = \frac{1}{2} * m * v^2$		

6. What is the mass of an object traveling at 30. m/s if it has 33,750 J of energy?

given variables	equation	work / picture	answer
m= v= KE =	$KE = \frac{1}{2} * m * v^2$		

7. Anna, who has a weight or gravitational force of 450 N, climbed 3 meters up a ladder to rescue her cat from a tree. How much work did she do?

given variables	equation	work / picture	answer
W= F= d=	$W = F \cdot d$		

8. An elevator lifts passengers to a window-lined observation room 192 meters above the ground. How much work does the elevators motor do to carry two passengers, who together have a weight or gravitational force of 550 N to this room?

given variables	equation	work / picture	answer
W= F= d=	$W = F \cdot d$		

9. Elijah does 44 joules (or 44 Newton\*meters) of work to pull a 1.0-kilogram bucket up to the floor of his tree house. How many meters high is his tree house?

given variables	equation	work / picture	answer
W= F= d=	$W = F \cdot d$		

10. What is the force required for Alec to push a box 15-meters if the work being done is 128 Joules (or 128 Newton\*meters)?

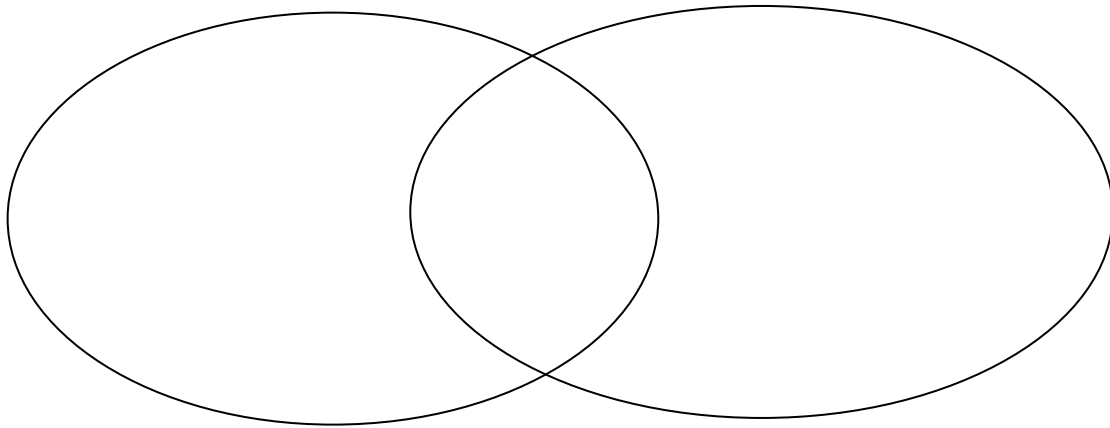
given variables	equation	work / picture	answer
W= F= d=	$W = F \cdot d$		

11. Give an example of work being done:

12. Give an example of when no work is being done but and object is still in motion:

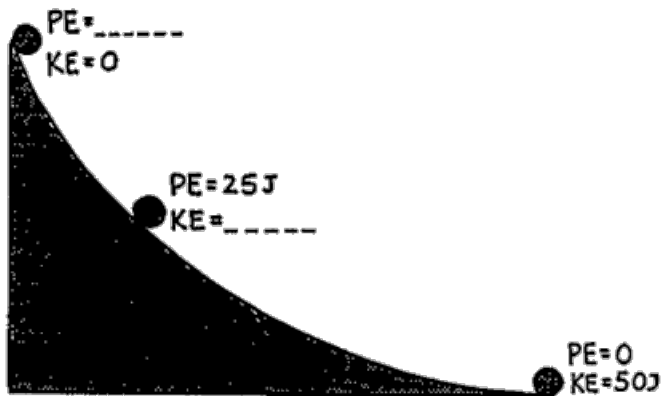
13. Give an example of when no work is being done and the object that the force is acting on remains at rest:

14. Compare and contrast Kinetic Energy versus Potential Energy using the Venn Diagram below:



15 a. What is mechanical energy?

b. Does the mechanical energy ever change?



16. Use the image above to answer the following questions:

**a. Fill in the missing values.**

b. If the ball had a mass of 1.5 kg, what is the height of the hill?

c. What is the velocity of the ball at the bottom of the hill?

d. What is the total mechanical energy in the image above?